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Technical Memorandum

To:	Rob Holmlund (HBHRCD)
From:	Erik Nielsen (SHN)
Date:	April 23, 2024
Subject:	**Marine Geotechnical Drilling Program Assessment**
Project:	Redwood Marine Multipurpose Terminal Replacement Project
Location:	Eureka, CA
M&N Job No:	212991-03
cc:	Shane Phillips (M&N)

Disclaimer: This draft technical memorandum is a work-in-progress and is intended to be an internal document for use by the Humboldt Bay Offshore Wind Heavy Lift Marine Terminal Project team as a part of the conceptual design process and the ongoing permitting process. This memorandum is meant to be read as a part of a comprehensive packet of technical analyses. It is not written to be a standalone document and it is assumed that the reader has substantial project knowledge and context to understand the memorandum's content. All aspects of this memorandum are subject to change and may become less accurate over time. To better understand the project, please review the more comprehensive and up-to-date documents posted to the Humboldt Bay Harbor District's website at https://humboldtbay.org/humboldt-bay-offshore-wind-heavy-lift-marine-terminal-project-3.

Introduction

This memorandum provides a summary of initial findings for implementation of the marine geotechnical drilling program for the Redwood Marine Multipurpose Terminal (RMMT) as outlined by Earth Mechanics, Inc. (EMI) in correspondence dated September 19, 2023. The EMI work scope identified 30 rotary borings and 30 vibracore borings at the locations shown on M&N Figure C-102 in Attachment 1. Drilling depths recommended are to elevation -200 feet, mean lower low water (MLLW) in the rotary borings and to 50 feet below the mudline (or refusal) in the vibracore borings.

Site Conditions

SHN staff met with Rich Reynolds from Gregg Drilling & Testing, Inc. (Gregg) at the RMMT site on September 27, 2023, to assess current conditions and the proposed work scope. Gregg possesses a wide range of capabilities for conducting overwater drilling work, has provided previous services for the RMMT project (CPT upland borings), and has worked with both SHN and EMI on numerous projects in the past. Gregg indicated the RMMT marine drilling program will require the use of different vessels and methods to complete due to project needs and varying site conditions.

A site plan showing project boring locations without planned development features are shown in Figure 2 in Attachment 1. Based on our assessment of the data collection requirements and site conditions, the geotechnical data collection work is outlined relative to the following three categories: 1) Open Water Borings, 2) Nearshore Borings, and 3) Onshore and Wharf Surface Borings.

Open Water Borings

Rotary and vibracore boring locations in areas with deep sediment depth are recommended for completion using the Quin Delta, a dedicated drill ship. This vessel measures 100 feet in length by 30 feet in width and has a draft requirement of 4 feet. The vessel is equipped with two spuds that are 80 feet in length to keep the vessel in position and a center moonpool for the advancement of drilling rods. Gregg indicated a rotary bore with an estimated drill depth of 190 feet may require 3 days to complete. A vibracore bore of 50-foot depth can be completed in less than a single day and multiple vibracore bores may be completed in a day if the drilling depth is reduced.

Sectional barges were also considered for completing the open water work, but the drawbacks from anchoring and maintaining position over the drill hole could become problematic and potentially result in project delays. Barges would additionally require the use of support vessels for movement and anchoring in place. The Quin Delta will allow for greater efficiency in positioning, relocating, and has an improved ability to stay over a drilling location for multiple days. The Quin Delta is capable of operating a platform for either a rotary or vibracore drilling rig.

Nearshore Borings

Rotary and vibracore boring locations in areas with a shallow mudline that are affected by tidal conditions will need to be installed from a barge. A floating barge and a jackup barge were both evaluated for use during completion of the nearshore borings with the benefits and drawbacks for each considered. The presence of timber piles and eelgrass in the nearshore areas were also factored into the discussion for type of barge use. A photograph showing RMMT nearshore conditions during a low tide event is provided in Attachment 1.

The preferred vessel for nearshore borings would be Gregg's jackup barge that is 50 feet in length and 16 feet in width and can facilitate operation of a rotary Geoprobe rig (see photo in Attachment 1). The jackup barge is equipped with three spuds that are 40 feet in length and able to maintain an elevated and level platform while drilling. Each spud is equipped with foot plates (4 feet by 8 feet) for working on mudflats (see photo in Attachment 1). The jackup barge is not subject to "beached" conditions during low tide, which will reduce downtime and can minimize the impacts to eelgrass in the work area. A floating barge would not be able to facilitate operations of drilling equipment if the "beached" conditions occur and the platform is not level. A floating barge will also create a larger footprint on the mudflat during low tide conditions that may impact sensitive habitat.

Onshore and Existing Wharf Borings

EMI has identified three onshore and seven rotary bores at the location of an existing wharf shown in Figure 2. This structure is in a dilapidated state and will require an engineering evaluation and presumably design for placement of steel plates, crane mats or a temporary "rail car" type bridge to support use of drilling equipment on the deck surface. Removal of portions of this wharf for barge access is not anticipated to occur prior to implementation of the geotechnical drilling program; therefore, a means of access yet to be determined will be required for permitting and implementation.

General Notes

Several nearshore borings are located in an area of timber piles that may require construction activities prior to mobilization of drilling equipment. Distance between each pile is approximately 12 feet and will inhibit open water access for a barge and drilling platform. This condition may require removal or cutting of piles to create a path for the barge to set up and position over a drilling location. It may be possible for the jackup barge to set up during high tide conditions and avoid the piles entirely, but this approach could involve additional risk that is not currently known which may cause delays during the field program.

To complete the RMMT marine geotechnical drilling program, some flexibility will need to occur in the exact locations provided by EMI due to constraints from obstructions and impacts to sensitive habitat. However, any significant gap in collection of data that could affect design would likely present an unacceptable risk for the project.

Several questions that need to be considered during development of the approach and permit application for the RMMT marine geotechnical drilling program include:

- Can wood pilings be pulled or cut? And what method of pile removal is available?
- Can an access road with clean gravel be built from land to near shore boring locations?
- Is the wharf capable of supporting drilling equipment with engineered design?
- If vibracore drilling method is unable to penetrate material below the mudline, will the absence of data (<50 feet) affect project design?
- Would a series of vibracore borings by HBHRCD-owned equipment provide improved information to nearshore sediment conditions to better refine dredge sediment characterization and marine geotechnical investigation work scope?

The mudline depth, tidal conditions, and effects of current on drilling operations all need to be taken into consideration to perform this work. No method will provide a failsafe approach to complete the RMMT marine geotechnical drilling program, but the most appropriate equipment with qualified personnel will provide the best opportunity to maintain production and complete the work in an efficient and timely manner.

The following are recommended prior to implementing a marine geotechnical drilling field program:

- **Wharf Condition Assessment** to determine a pathway for drill rig access and temporary improvements needed to support the equipment for drilling operations.
- **Pre data marine drilling work site preparation.** This will likely require the District to hire a contractor to remove pilings and provide temporary shoring on the wharf for the drilling equipment to gain access over wharf and nearshore boring locations. The pile removal work is likely subject to work window constraints and will need to be considered in the data collection scheduling.
- **Confirmation from DMMO** for sediment sampling techniques and the sediment Sampling and Analysis Plan (SAP) for dredged material testing to collect data in the same mobilization, if at all possible, for the nearshore and over wharf areas.

Attachment 1. Figures

FIGURES 1

3

Northern Quay: Approx 1,600 ft
Southern Quay: Approx 1,600 ft

Delivery vessels: 610 ft
Foundation sizes: Edge to Edge - 390 ft
Components 18MW turbines

CRITERIA

1. BERTH AREA: -40' MLLW (WILL BE LOWER THAN THE CHANNEL)
2. DEVICE BASE STORAGE (BASE ONLY): -28' MLLW
3. INTEGRATED DEVICE STORAGE (FULL TURBINE): -38' MLLW
4. SINKING BASE: -60' MLLW

NOTES

1. THE EELGRASS DATA WAS OBTAINED FROM THE HUMDBOLDT BAY HARBOR, RECREATION, AND CONSERVATION DISTRICT EELGRASS DISTRIBUTION MAP. DATA WAS LAST UPDATED WITH SURVEYS CONDUCTED IN FALL 2016.
2. LOCATION OF NAVIGATION AIDS BASED ON NAUTICAL CHART 18622 56TH ED. LAST CORRECTED ON NOVEMBER 2021.

LEGEND

CABLE AREA
DREDGING AREA
EELGRASS
PATCHY EELGRASS
EXISTING BUOY
EXISTING LIGHT
15.00 EXISTING MAJOR CONTOUR (NAVD88, SHN 2022)
EXISTING MINOR CONTOUR (NAVD88, SHN 2022)

WOOD PRODUCTS MANUFACTURING BUILDING (40,000 SF)
OFFICE BUILDING (20,000 SF)
BREAKBULK HANDLING BUILDING (60,000 SF)
FLOATING FOUNDATION FABRICATION AND LOADOUT PORT - 66 ac
FLOATING OFFSHORE WIND PORT - 58 ac
FLOATING OFFSHORE WIND PORT - 47 ac
DREDGE OVERLAP WITH EELGRASS = 122,152 SF
OFFSHORE WIND PORT MARINE TERMINAL AREA
FABRICATION & ASSEMBLY BUILDING (50,000 SF)
CRANE
1,600 ft
DELIVERY
Approx. Dredge footprint (~35 ac)
Dredge (~22ac)
470 ft
EXISTING RMT II DOCK
DEVICE BASE STORAGE, TYP
DREDGE TO EL -40' + 2' O.D.
DREDGING SLOPE 2H:1V
SINKING BASIN, DREDGE TO EL -60' + 2' O.D.
NORTH ENTRANCE
HUMBOLDT BAY
681'
400'
DEVICE BASE STORAGE 1, DREDGE TO EL -38' + 2' O.D.
EXISTING SAMOA FEDERAL TURNING BASIN (EL -38')
100'
MIN. 50'
2064'
SR 255 - SAMOA BRIDGE
3489'
EXISTING EUREKA CHANNEL INNER REACH (EL -38')
CABLE AREA TO BE VERIFIED
TULUWAT ISLAND
DEVICE BASE STORAGE 2, DREDGE TO EL -38' + 2' O.D.
1880'
935'

LEGEND

Proposed Rotary Boring
Proposed Vibracore Boring

Notes:
Marine Borings should be drilled to EL. -200 ft, MLLW.
Vibracores should be drilled to 50 ft below the mudline or to refusal.

300' 0' 300' 600'
SCALE: 1"=300'

FOR CONCEPTUAL DESIGN
ISSUED: 2023-08-01
NOT TO BE USED FOR CONSTRUCTION

INSERT PROJECT NAME HERE

PROPOSED CONDITIONS
ALT 1 - EELGRASS

Sheet Reference No.
C-102
INDEX: 5 OF 7

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

File: Q:\SEA\21\2991-03\30 CADD_Active_Ops\2799103-C-102 - Plotted: 8/1/2023 4:14 by GIAMMARINO, RICARDO - Saved: 8/1/2023 2:55 by RGIAMMARINO

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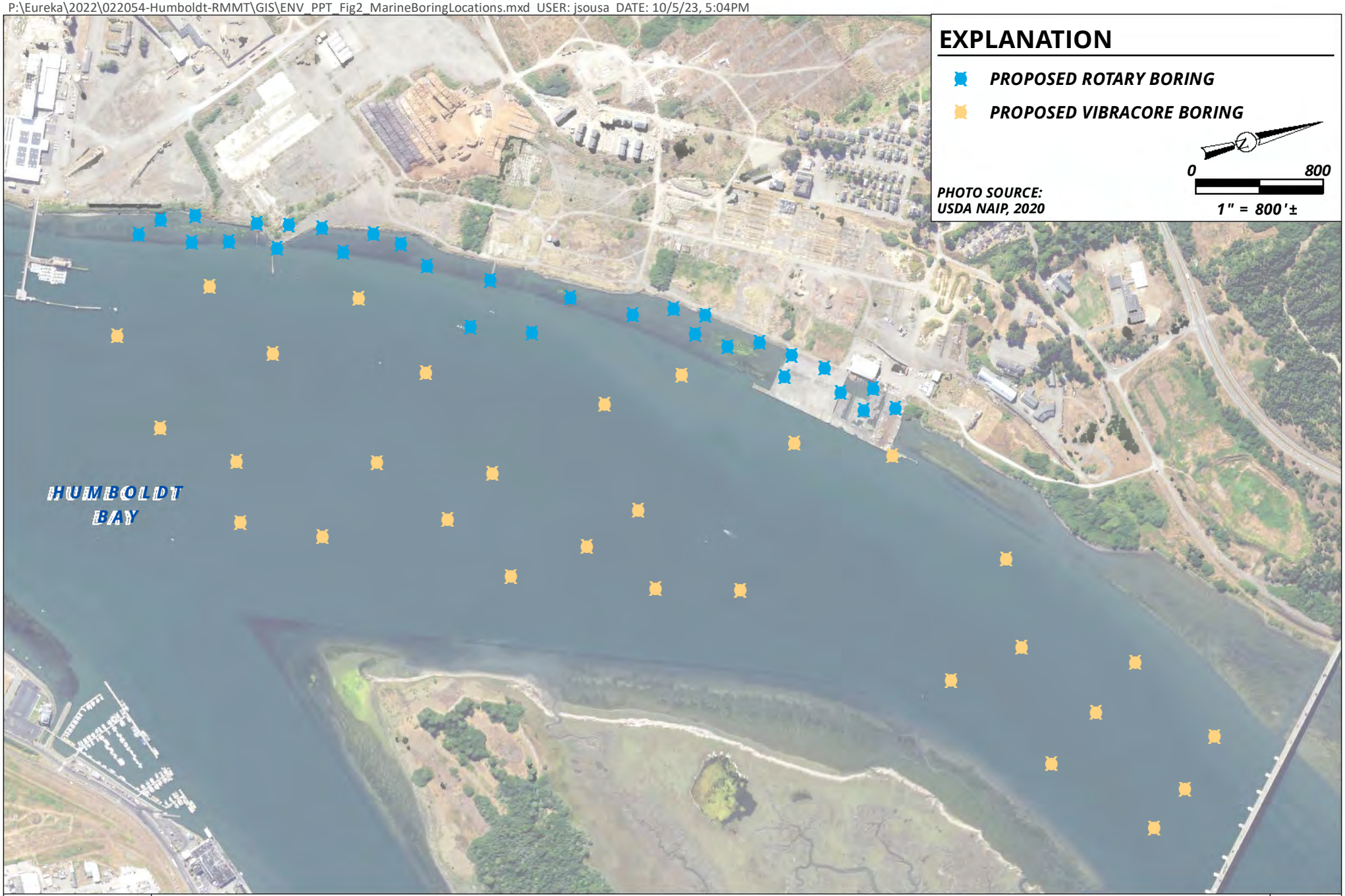

Humboldt Bay Harbor, Recreation & Conservation Dist.
Humboldt Bay Offshore Wind Heavy Lift Marine Terminal
Eureka, California

Proposed Marine Boring Locations

October 2023 - 022054.400

Figure 2


Geoprobe